

CLAIMS

1. A liquid crystal display device comprising:
 - a first substrate (3) and a second substrate (4) which are arranged so as to oppose to each other;
 - 5 at least one first electrode (6) which is formed on one of opposing internal surfaces of said first substrate (3) and said second substrate (4);
 - a plurality of second electrodes (7) which are formed on the other of the opposing internal surfaces of said first substrate(3) and said second substrate (4), and which form a plurality of pixels (80) arranged in a matrix in an area opposing to said first electrode (6)
 - 10 on the one internal surface;
 - a liquid crystal layer (5) which is sealed in a predetermined gap between said first substrate (3) and said second substrate (4);
 - a pair of polarizing plates (16, 17) which are arranged so as to sandwich said first substrate (3) and said second substrate (4);
 - 15 reflection/permeation means(10,14,15) which is provided between said liquid crystal layer (5) and one of said pair of polarizing plates (16, 17), and which reflects a part of a light coming to each of said plurality of pixels (80) and lets the other part of the light permeate said reflection/permeation means; and
 - a surface light source (25) which is arranged so as to oppose to the other of said pair
 - 20 of polarizing plates (16, 17), and which emits a light toward said opposing other polarizing plate (16), and lets lights coming to said surface light source (25) from a side of the opposing other polarizing plate (16) and from a side opposing to this side permeate said surface light source (25).
2. The liquid crystal display device according to claim 1, wherein said
- 25 reflection/permeation means(10,14,15) is constituted by a half-transparent and half-reflection film (10) which reflects and allows permeation of, an incident light with a predetermined reflection ratio and a predetermined permeation ratio.

3. The liquid crystal display device according to claim 1, wherein said reflection/permeation means(10,14,15) is arranged on the internal surface of said first substrate (3) or said second substrate (4) on a side of said one polarizing plate (17).

4. The liquid crystal display device according to claim 1, wherein said reflection/permeation means(10,14,15) is constituted by a reflection film (14) having an open portion (14a) and a reflection portion (14b) formed for each of said pixels (80) to constitute a partial reflection/permeation layer(14) which reflects, of a light coming to each of said pixels (80), a light that comes to said reflection portion (14b), and lets a light that comes to said open portion (14a) permeate said reflection/permeation means.

10 5. The liquid crystal display device according to claim 4, wherein said partial reflection/permeation layer(14) is arranged on the internal surface of said first substrate (3) or said second substrate (4) on a side of said one polarizing plate (17).

6. The liquid crystal display device according to claim 4, wherein said partial reflection/permeation layer(14) is constituted by a metal reflection film in which an opening having a predetermined size is formed for each of said plurality of pixels (80).

7. The liquid crystal display device according to claim 1, wherein said reflection/permeation means(10,14,15) is constituted by a polarized light separating element (15) which reflects, of two different polarized components of an incident light, one polarized component, and lets the other polarized component permeate said reflection/permeation means(10,14,15).

8. The liquid crystal display device according to claim 1, wherein said reflection/permeation means(10,14,15) is constituted by a reflecting/polarizing plate (15) which serves also as said one polarizing plate (17), and which reflects, of two linearly-polarized components of an incident light which are orthogonal to each other, one polarized component, and lets the other polarized component permeate said reflection/permeation means(10,14,15).

9. The liquid crystal display device according to claim 1, further comprising at

least one retardation plate (18, 19) which is arranged between said pair of polarizing plates (16, 17).

10. The liquid crystal display device according to claim 9, wherein two of said retardation plate (18, 19) are arranged so as to sandwich said first substrate (3) and said
5 second substrate (4).

11. The liquid crystal display device according to claim 1, further comprising a scattering layer (20) which is arranged between said other polarizing plate (16) and said first substrate (3) or said second substrate (4) on a side of said other polarizing plate (16).

12. A liquid crystal display device comprising
10 a liquid crystal display element including:
a first substrate (3) and a second substrate (4) which are arranged so as to oppose to each other;
at least one first electrode (6) which is formed on one of opposing internal surfaces of said first substrate (3) and said second substrate (4);
15 a plurality of second electrodes (7) which are formed on the other of the opposing internal surfaces of said first substrate (3) and said second substrate (4), and which form a plurality of pixels (80) arranged in a matrix in an area opposing to said first electrode (6) on the one internal surface;
a liquid crystal layer (5) which is sealed in a predetermined gap between said first
20 substrate (3) and said second substrate (4);
a pair of polarizing plates (16, 17) which are arranged so as to sandwich said first substrate (3) and said second substrate (4);and
a reflection/permeation layer(10,14,15) which is provided between said liquid crystal layer (5) and one of said pair of polarizing plates (16, 17), and which forms a
25 reflection display region for reflecting a light coming to a region predefined in each of said plurality of pixels (80), and a permeation display region for letting a light coming to other than the reflection display region permeate said reflection/permeation

layer(10,14,15),and

a surface light source (25) which is arranged so as to oppose to the other of said pair of polarizing plates (16, 17), and which emits a light toward said liquid crystal display element(1), and lets lights coming to said surface light source (25) from a side of the
5 opposing other polarizing plate (16) and from a side opposing to this side permeate said surface light source (25).

13. The liquid crystal display device according to claim 12, further comprising two retardation plates (18, 19) which are arranged between said pair of polarizing plates (16, 17) so as to sandwich said first substrate (3) and said second substrate (4).

10 14. The liquid crystal display device according to claim 12, further comprising a scattering layer (20) which is arranged between said other polarizing plate (16) and said first substrate (3) or said second substrate (4) on a side of said other polarizing plate (16).

15 15. The liquid crystal display device according to claim 12, wherein a part of said liquid crystal layer (5) that corresponds to the reflection display region is thinner than a part of said liquid crystal layer (5) that corresponds to the permeation display region.

16. The liquid crystal display device according to claim 12, wherein:
said first and second electrodes (6, 7) are made of transparent electrodes; and
said reflection/permeation layer comprises a reflection film which is formed so as to
correspond to the reflection display region and the permeation display region of each
20 pixel (80).

17. A portable apparatus comprising
a liquid crystal display device including:

a first substrate (3) and a second substrate (4) which are arranged so as to
oppose to each other;

25 a at least one first electrode (6) which is formed on one of opposing internal
surfaces of said first substrate (3) and said second substrate (4);

a plurality of second electrodes (7) which are formed on the other of the

opposing internal surfaces of said first substrate (3) and said second substrate (4), and which forms a plurality of pixels (80) arranged in a matrix in an area opposing to said first electrode (6) on the one internal surface;

a liquid crystal layer (5) which is sealed in a predetermined gap between said
5 first substrate (3) and said second substrate (4);

a pair of polarizing plates (16, 17) which are arranged so as to sandwich said first substrate (3) and said second substrate (4);

reflection/permeation means(10,14,15) which is provided between said liquid crystal layer (5) and one of said pair of polarizing plates (16, 17), and which reflects a
10 part of a light coming to each of said plurality of pixels (80) defined by said first electrode (6) and said second electrodes (7) and lets the other part of the light permeate said reflection/permeation means(10,14,15); and

a surface light source (25) which is arranged so as to oppose to the other of said pair of polarizing plates (16, 17) , and which emits a light toward said opposing other
15 polarizing plate (16), and lets lights coming to said surface light source (25) from a side of the opposing other polarizing plate (16) and from a side opposing to this side permeate said surface light source (25), and

a body which is provided with display windows on its two opposing external surfaces, and inside which said liquid crystal display device is accommodated,
20 wherein said liquid crystal display device is accommodated in said body such that a front surface of said liquid crystal display device is faced with said display window on one of the two external surfaces, and a back surface of said liquid crystal display device is faced with said display window on the other of the two external surfaces.

18. The portable apparatus according to claim 17, wherein said portable apparatus
25 is a portable phone (40).

19. The portable apparatus according to claim 17, wherein said portable apparatus is a personal computer (60).